

and publication all barometric observations will be correlated to this "adopted or station elevation." In case, therefore, an office is moved to new quarters and the elevation of the barometer is thereby changed, a proper correction will be applied to the barometric readings in the new location that will reduce the observed reading to the pressure appropriate to the "station elevation," notwithstanding changes and removals.

The pressure thus ascertained will be designated "station pressure."

The "station elevation" for a station in operation January 1, 1900, will be its elevation above sea level on that date. For stations closed before 1900, or subsequently established, the elevation will be, in general, the elevation above sea level of the zero point of the barometer at the date of closing or opening the respective stations.

Reduction of current observations in accordance with the foregoing plan will, therefore, be required only when changes are made in the elevations of the barometers. In all such cases, the Instrument Division of the Central Office will furnish a new copy of the barometer correction card (Form No. 1059-Met'l), in which a "removal correction," based on the change made in the elevation of the barometers will be combined with the corrections for local gravity, scale errors, etc. The "sum of corrections" thus determined, together with the "correction for temperature," will be applied to all recorded readings of barometric pressure, and the result will be regarded as the pressure of the air appropriate to the station in question.

The barograph will be adjusted and corrected to correspond with the corrected air pressure thus obtained.

The following example will elucidate the complete correction of observed barometer readings:

Observed barometer reading (attached thermometer, 76.5°)	30.287
Correction for temperature	-0.131
Sum of corrections, Form No. 1059-Met'l.	+0.032
Total correction	-0.099
Station pressure	30.188

The "total correction," as shown above, will be entered on the present edition of Form No. 1001-Met'l, in the column in which the "correction for temperature" has been recorded heretofore, and applied to the "observed" reading, deriving thereby the pressure of the air appropriate to the adopted elevation of the station, which pressure will be recorded in the adjoining column.

All pressure observations made at a station and reduced according to the foregoing plan will, therefore, be strictly comparable with each other, all being reduced to the adopted elevation. Furthermore, a change of elevation and removal of office will not, as heretofore, necessitate a new table of reductions to sea level; that is, all observations will be reduced to sea level, when required, by one and the same table of reduction; namely, that based on the adopted elevation of the station.

The following nomenclature, embracing barometric terms, will be used, as far as practicable, in the correspondence, records, and publications of the Weather Bureau:

Actual elevation.—The height of the zero points of the barometers of a station above sea level.

Station elevation.—The elevation above sea level adopted for a station as the basis to which all pressure observations at the station are correlated.

Observed reading.—The direct result of the reading of an instrument, uncorrected for any errors.

Actual pressure.—Meaning the actual pressure of the air at a barometer, as obtained from the observed reading after

applying the necessary corrections for temperature, gravity, and instrumental errors.

Station pressure.—A pressure corresponding to an "adopted or station elevation" differing slightly from the actual elevation of the barometer. When the actual elevation is the same as the station elevation, the removal correction will be zero and the actual pressure and the station pressure are then numerically equal.

Reduced pressure.—The actual or station pressure reduced to sea level, or to some other specified plane.

Correction for scale errors, capillarity, etc.—A mean difference between the readings of a given instrument and those of the standard barometer duly corrected. This quantity embraces all outstanding errors in the total length and in the subdivision of the scale; errors in the adjustment of the sight-edge to the zero line of the vernier; errors of capillarity, imperfect vacuum, etc.

Correction for temperature.—The correction depending on the temperature of the mercury and the metallic scale.

Correction for local gravity:

(a) *Latitude term.*—The correction based on the variation of the force of gravity with latitude.

(b) *Altitude term.*—The correction based on the variation of gravity with altitude above sea level.

Removal correction.—The correction necessitated by the removal of an office, and based on the difference between the actual elevation of the barometer in the new location and the adopted elevation for the station in question.

Sum of corrections.—A term embracing all the corrections that are practically constant for a given instrument and in a given location, namely: the correction for scale error, capillarity, gravity, and the removal correction. This sum is given on the certificate of corrections (Form No. 1059-Met'l) furnished for each instrument.

Total correction.—The correction for temperature, plus the "sum of corrections" as defined above.

Reduction to sea level.—The quantity which must be added to the "actual" or "station" pressure, in order to obtain the "reduced" pressure.

Reduction for elevation.—A quantity which must be added to or subtracted from the pressure at a given elevation in order to deduce therefrom the pressure appropriate to some other specified elevation.

METEOROLOGY IN THE UNIVERSITIES.

Prof. James A. Lyon of the Southwestern Presbyterian University, Clarksville, Tenn., writes:

Our college has been enabled to take a much needed step forward in expanding somewhat our scientific department, allowing me to introduce a course in meteorology. I am using the text book of W. M. Davis, which I find an excellent one in many respects. I want to supplement the text book by as much practical work and instrumental illustration as possible.

The modern methods of teaching require that instruments be available and observations be taken in order to carry out the so-called "laboratory method" of instruction. Those who keep weather records are best prepared to profit by the work of the Weather Bureau. Those who deal in accurate measurements can best appreciate the spirit that animates all who are devoted to the progress of meteorology. Even if a school has not the funds to purchase a small outfit at the present time yet it is well to teach the subject as thoroughly as is practicable. Records of the sensible changes in temperature and dryness, the rainfall, winds, weather, and clouds, and the progress of vegetation, are still as valuable as they were long ago, when instruments were comparatively rare, and will always be of the greatest importance as a means of educating one to observe accurately and reason

correctly. The study of nature has both an intellectual and a scientific aspect. From the latter point of view one records new or special phenomena, and may hope to discover new laws of nature, but from an intellectual point of view the study becomes a means of increasing one's knowledge and disciplining one's reason and senses; from this point of view, every one, old and young, must derive benefit from the study.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

Mr. Barry C. Hawkins, Voluntary Observer, Horse Cove Station, N. C. (post office address, Highlands, Macon Co., N. C.) desires to exchange back numbers of the MONTHLY WEATHER REVIEW for the following publications:

Weather Bureau Bulletin No. 11, Parts 1 and 2.

Signal Service Notes No. 9. "Weather Proverbs."

Greely, "Report on the Climatology of the Arid Region."

Greely, Report on the Lady Franklin Bay Expedition.

METEOROLOGICAL OBSERVATIONS AT PUBLIC SCHOOLS.

The following is an excellent presentation of this subject by Mr. H. E. Wilkinson, Local Forecast Official and Section Director, Vicksburg, Miss., and is reprinted from the December report of the Mississippi Climate and Crop section. Ideas similar to those of Mr. Wilkinson have indeed been advocated by others in other places, but his presentation is quite well worth reading. The study of nature herself and familiarity with nature rather than with books is the leading idea of modern education, from the primary school up to the post graduate schools of the university.

In the autumn of 1881 the Editor's attention was drawn to the excellent "Nature Study" introduced into the Normal School at Washington, D. C., and thence into the lower grade public schools, by Miss Lucilla E. Smith, who subsequently removed to Brooklyn, N. Y., and introduced the same ideas into the schools of that city. The fundamental principles of nature study are now rapidly spreading throughout this country and must eventually prevail everywhere, for they are founded on correct principles and necessarily bring about successful results. A child is naturally a learner; he is an inquisitive student and experimentalist. At first he learns by bumps and bruises and through pains and troubles; frequently he actually makes experiments and observes closely and reasons and argues to himself. It is always easier for him to learn by personal experience than by reading books or listening to others tell about things as seen by them. Give him stones, woods, flowers, birds, insects, animals, clay and sand, tools and materials to handle and work with. He learns best about men and things and principles by coming into daily personal contact with them. In order to stimulate him to accuracy, he is encouraged to measure and record carefully. The weather lends itself to this method of training quite as easily as any other subject. He may learn a little meteorology, but more important is it that he learn accuracy of observation and correct logical reasoning. The set of forms for a daily record of the weather introduced into the Wash-

ington Normal School in 1881, by the present writer, was simply a suggestive leader for the children and their teachers. Both these forms and the work done were subsequently put on exhibition in the Educational Department of the Exposition at New Orleans, La., in 1884-5.

In an address before a teachers institute in California several years ago the writer urged that every school house be provided with instruments and weather observations be taken. This opinion has been strengthened by the publication recently of a circular by the Department of Agriculture entitled "A German Common School with a Garden," from which the following extracts are taken:

"In most instances this garden is used solely as a source of income and pleasure to the teacher. Occasionally, however, some specially active and wide-awake teacher sees in the garden a means of instruction. Here plants can be watched in their development from seed to flower and fruitage; the curled leaves on a choice plant may show where some insect has made its home; a heavily-laden apple tree may suggest the value of pruning; a few pansies or a rose bush rightly placed may awaken ideas of beauty. * * * Pupils working among these flowers, pruning trees, or gathering berries from vines planted and tilled by themselves, may acquire an interest in nature and husbandry which will remain with them throughout their after life."

It is for the same good of the scholar that weather observations should be taken at every school house. A wide-awake teacher with a maximum and minimum thermometer and a rain gage can soon develop such an interest in a practical way that the lessons in physical geography, instead of being dull, will become intensely interesting and the scholars will have demonstrated to them in practice what the geographies teach theoretically.

The Weather Bureau has been doing a work of education since its organization, but notwithstanding the hundreds of thousands of weather maps and other publications that are disseminated annually comparatively few people receive them. It has undertaken to cover the country with its regular stations of observation, supplemented by the cooperating voluntary observer. This in whole amounts to about 3,035 points of observation and covers not only the United States proper but points in the West Indies and bordering on the Caribbean Sea and Alaska. Deducting the West Indian service and Alaska, we have one station for about every 1,175 square miles.

Of course the larger number of observations are made in the more thickly populated parts of the country. California, as an instance, with its 158,360 square miles has 318 observing stations, or one for about every 500 square miles, while Texas with 265,780 square miles has but one station for every 2,550 square miles. It is impracticable for the general Government to so cover the country as to bring out local climatology, now much needed. The study of climatology was never so closely followed as now. Meteorology has never been connected with so many subjects as at present. The weather influences every process of life, every plant, and every animal. It is the commonest topic of conversation, the subject considered in connection with more plans than any one thing, and yet there is but one observer for every 1,175 square miles, approximately, and very few people apply the facts given each day in any practical way. It is so commonplace, in fact, as to be generally neglected.

With a class of people in our schools interested in the science of meteorology an intelligent knowledge of the movement of storms and climatology will soon attain and the great service of the Weather Bureau made of increasing value. Every section has its peculiarities of temperature and precipitation, but because of the lack of observation nothing is known of these peculiarities. The General Government makes exhaustive experiments on the growth of plants. We are told just what kind of a soil or climate is best adapted to the successful cultivation of nearly every useful plant, and the people should avail themselves of this knowledge by more completely studying the local conditions as related to temperature, precipitation, humidity, etc., and by applying one to the other.

A plan of work by which this idea might be carried into effect would at best be tentative. It must be elastic enough to admit of its adoption under many and varying conditions and yet reach the same general result. The most feasible plan is thought to be that of having the teacher responsible in person for the work, but through her the scholars perform the actual work, her participation being more in the nature of an instructor and not as an observer. There is frequently some scholar in a school who is fond of investigation, or who takes more than a passing interest in the weather. Such would make a good observer. The scholar should be taught to apply personal observation and connect present conditions with those following, as well as those past, and in this way note the rotation of storms. The blackboard in the school room affords a simple means of interesting the entire school by placing each day's observation thereon. The permanent records should be maintained in a book kept for that purpose. As the record grows daily it will become more interesting. The problem of small attendance at school on certain days, or the mental depression and consequent lack of satisfactory progress in studies and many other equally interesting problems will find solution.